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SEINÄJOEN AMMATTIKORKEAKOULU
SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

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Product Quotation Process Optimization

Thesis
Autumn 2024
Master's Degree Programme in International Business Management

SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

Thesis abstract

Degree Programme: International Business (Master of Business Administration)

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Title of thesis: Product Quotation Process Optimization

Supervisor: Dr. Adebayo Agbejule

Year: 2024 Number of pages: 49 Number of appendices: 1

The main objectives of this thesis were to become familiar with the target company's current product quotation process and to find the ways for its optimization for the Northern Europe tendering team of the case company.

A literature review, forming the theoretical part of the study, was conducted over the topics of quotation process, lean, and value stream mapping. Based on the literature review, the interview questions were derived for the empirical study.

The empirical study was conducted utilizing qualitative methods and data collection with semi-structured interviews. Three interviewees were selected from the Northern Europe tendering team, being subject matter experts in the topic in question. The interview questionnaire included two sets of questions, the first one addressing the current product quotation process and the second one finding ways for its optimization. The interviews were recorded and transcribed to increase reliability. Although the number of interviewees was limited, the results were quite saturated, as similar responses was recognized among the answers. It was found, for example, that there are differences in the ways of working between countries, room for process optimization based on lean theory, and a need for a modern web shop platform allowing customers' direct access and ordering of products.

The results of the empirical part of the study were in line with the findings from the theoretical part. The interviewees brought out unnecessary waiting time and information processing as examples that according to lean are waste and should be eliminated. Some of the findings of this study are already recognized by the case company, e.g., a new web shop is currently under development, and thus the findings of this study should be considered as input for verifying the functionality of the new tool from the tendering perspective, too.

[1] Keywords: Quotation process, optimization, lean

SEINÄJOEN AMMATTIKORKEAKOULU

Opinnäytetyön tiivistelmä

Tutkinto-ohjelma: International Business (Master of Business Administration)

Tekijä: Jarkko Hautamäki

Työn nimi: Product Quotation Process Optimization

Ohjaaja: Dr. Adebayo Agbejule

Vuosi: 2024 Sivumäärä: 49 Liitteiden lukumäärä: 1

Tämän tutkimuksen pääasiallisena tavoitteena oli tutustua kohdeyrityksen Pohjoismaiden tarjouslaskentatiimin tuotemyyntiprosessiin ja löytää tapoja prosessin kehittämiseksi.

Kirjallisuuskatsauksessa, joka muodostaa työn teoriaosuuden, tutustutaan tarjouslaskentaprosessiin sekä lean- ja value stream mapping -teorioihin. Kirjallisuuskatsaukseen pohjautuen muotoiltiin haastattelukysymykset ja luotiin perusta tutkimuksen empiiriselle osuudelle.

Empiirinen tutkimus toteutettiin laadullisia menetelmiä käyttäen, ja aineisto kerättiin keruun puolistrukturoiduilla haastatteluilla. Kolme haastateltavaa valittiin kohdeyrityksen Pohjoismaiden tarjouslaskentaosastolta, ja he olivat tutkittavan prosessin asiantuntijoita. Haastattelukysymykset oli jaettu kahteen osioon, joista ensimmäisen tavoitteena oli selvittää tämänhetkinen prosessi ja jälkimmäisen löytää mahdollisia kehityskohteita. Haastattelut nauhoitettiin ja litteroitiin luotettavuuden lisäämiseksi. Vaikka haastateltavien määrä oli rajattu, tulokset olivat melko kylläisiä, ja vastauksissa oli havaittavissa yhtäläisyyksiä. Tutkimuksessa saatiin selville muun muassa, että eri maiden välillä on erilaisia työskentelytapoja, tarjouslaskentaprosessia on mahdollista kehittää lean-metodeilla ja että tarve uuden verkkokauppatyyppisen ratkaisun kehittämiselle on ilmeinen.

Empiirisen tutkimuksen ja kirjallisuuskatsauksen tulokset olivat samankaltaisia. Haastattelut toivat esiin esimerkiksi tarpeettoman odotusajan sekä tarpeettoman tiedonkäsittelyn, joista molemmat ovat lean-teorian mukaan hukkaa, jotka pitäisi pyrkiä poistamaan. Osa tämän tutkimuksen löydöksistä on jo kohdeyrityksen tiedossa, kuten uuden verkkokaupparatkaisun kehittäminen, joten tämän työn tuloksia tulisi käyttää lähdeaineistona varmistamaan uuden kehitettävän ratkaisun toiminnallisuus myös tarjouslaskennan näkökulmasta.

[1] Asiasanat: Quotation process, optimization, lean

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Terms and Abbreviations

BOL	Business Online
ERP	Enterprise Resource Planning
RFQ	Request for Quotation
TPS	Toyota Production System
VSM	Value Stream Mapping

1 INTRODUCTION

Complex products, large projects, high customer requirements and today's legislation are setting boundaries for today's tender preparation process. While preparing tender one needs to ensure all aspects are covered and submitted bid fulfills the requirements and legislation. This requires both time and efforts from person in charge of tendering. To shorten the tender preparation time companies must ensure a clear tender preparation process is in place and tools utilized are optimized for their purpose.

According to Keyte and Locher (2004, pp. 15–17), many companies have applied lean transformation and made investments in manufacturing environment but skipped the office environment. This results to non-complete value map and prevents company seeing potential savings. Typically, information management in office creates even more waste than in manufacturing environment. Applying lean in office environment requires understanding of office value streams to be able to identify waste. The waste might for example include waiting time, extra processing, or correction.

Tender preparation process consists of sequence of steps, repeating in every tender, thus it is possible to investigate the process from lean methods perspective. Lean methods target to create needed value with less resources and waste, increasing the efficiency of the process. Value stream mapping (VSM) is one of lean tools used to identify value adding and non-value adding activities of process. The VSM process is always started by creating current state value stream map, that is to say the flow of information and materials is illustrated in graphical form, possibly including processing and waiting time in and between each activity. While starting to optimize process it is advised to start by focusing on non-value adding (waste) components and trying to minimize those ones, instead of further optimizing the value adding ones. Although one of the lean principles is that customer should be willing to pay for every action supplier is taking, in most cases during VSM exercise there are essential internal company processes identified which cannot be avoided, even from customer and lean perspective those could be identified as waste.

This thesis was done for Hitachi Energy Grid Automation business unit and focusing on tendering Northern Europe, covering Finland, Sweden, Norway, and Denmark. The core business of Grid Automation unit is system sales but as having own product factories, non-

system related product sales has increased in past years mostly due to high demand in electrification of society. During the years it has been recognized the current tendering processes are not optimal for product sales, for which reason it was decided to investigate the current processes and find the ways for optimization.

Demand in Northern Europe countries is varying, resulting tendering team overload in one country while another might have free capacity. From historical reasons each country has own standards for tender preparation and thus it was seen important to investigate the processes on a way forward to one unified tendering Northern Europe team. Also, the best practices and biggest bottlenecks is to be identified to able to streamline the process and eliminate the waste. The study is focusing on tender preparation activities and related processes after receiving a request for quotation (RFQ) from the customer until the submittal of a product quotation.

1.1 Research gap

Familiarizing with the recent scientific articles around product quotation process gave a view lean and value stream mapping (VSM) are the most commonly utilized theories for process optimization. Nevertheless, during literature review it was recognized not to have books or comprehensive articles about applying lean or VSM specifically in quotation process. Also, it was known no-one has been thinking the product quotation process from those perspectives in the case company.

1.2 Aim of the study

The aim of this study is to investigate the current product quotation process in Finland and Sweden, gain an understanding of differences and reasons behind, as well as find the ways for optimizing the process.

During the study the company is taking into use a common Enterprise Resource Planning (ERP) system enabling cross-border activities, and thus the benefits of centralizing product quotation team can also be evaluated.

Addressing the aim of the study the following research questions were formulated:

- What is the current Product quotation process in Tendering Nordic countries?
- How can the Product quotation process be more efficient and faster without compromising quality?

1.3 Hitachi Energy

Hitachi Energy (Hitachi Energy, n.d.-a, n.d.-b, n.d.-c) is the global leader in providing innovative power technologies and energy solutions for the customers in utilities, transportation, industry, and infrastructure. The systems provided help customers plan, build, operate, optimize, and maintain the power infrastructure in a more sustainable, flexible, and secure way. As the pioneering technology leader Hitachi Energy is closely collaborating with customers and partners to enable a sustainable energy future.

Hitachi Energy is consolidated subsidiary of Japanese Hitachi Ltd., headquartered in Switzerland and employs around 40 000 people in around 100 countries (Hitachi Energy, 2022).

1.4 Structure of the thesis

Chapter 2 of this thesis consist of literature review as a theoretical part of this study. Starting with basic information about quotation process to familiarize the reader with the overall process required for tender preparation. The following sub-chapters are introducing the main principles, terms, and application of lean and value stream mapping concepts, which were recognized as the most dominant theories around process optimization.

Research methods are introduced in Chapter 3, including short descriptions about the methods selected to be applied in this qualitative case study. Also, the basics of reliability and validity, data collection, and data analysis are covered.

The empirical part of the study, Chapter 4 focuses on data collection and sampling and interview findings, including citations from interviews.

Chapter 5 includes an analysis of the interviews; the empirical findings are also compared with the findings from the literature review.

The final chapter, Chapter 6, consists of conclusions, including a theoretical contribution where empirical findings are compared with literature review, findings and development ideas under practical section, and the finally the limitations and further research suggestions are addressed.

2 LITERATURE REVIEW

Reviewing the recent scientific articles around product tendering process and product quotation process the two main theories were dominant, including 1. Lean, and 2. Value Stream Mapping.

The sub-chapters of this Chapter 2 are giving theoretical overview of above-mentioned theories. Also, the basic principles of quotation process itself is covered.

2.1 Quotation process

Generally, the starting point of quotation preparation process is either successful sales activities or direct request for quotation (RFQ) received from customer. With RFQ customer specifies product(s) and/or services they ask for quotation from supplier. As a response to the RFQ supplier prepares a quotation including for example exact product characteristics, offered price, delivery time and terms, and payment terms.

According to Jaques (2013, p. 8), the quotation process has been changing since old days when the deals were sealed on golf course or over dinner, with a short discussion about the works required and brief price negotiation. The change has been driven by the European Union, legislation, and professional procurement. By today it is not uncommon the supplier needs to participate into pre-contract competition via written submission. Typically, in this case the purchaser distributes the tender documents with clear instructions to be followed for creating a quotation. The quotation tells how the supplier can meet the set requirements and how much he will charge for the works.

Saastamoinen et al. (2017, p. 17) describe the overall quotation preparation process to be like illustrated in the below Figure 1.

Figure 1. Quotation preparation process (Saastamoinen et al., 2017, p. 17).

Saastamoinen et al. (2017, p. 18) highlight the importance of careful evaluation of received RFQ. The main purpose of evaluation is to ensure the basic requirements of securing and successful execution of the job exist. The evaluation is started from the sender of the RFQ. If the sender is already known or it is known the sender requires similar products or services also in future, it is worth proceeding RFQ evaluation. In case the sender is unknown it is worth of trying to find out if the sender is just trying to bargain the price with their regular supplier. As a next step it is required to evaluate if the requested products and/or services are fitting in company offering, for example is the manpower available on requested time, or are there products or services needed to be outsourced. On top of previously mentioned, Jaques (2013, pp. 41–42) brings out three big questions to be answered honestly.

- Is it deliverable?
- Is it winnable and
- Will it be profitable?

Unless the answer is ‘yes’ for all of them there is no point on taking any efforts of bidding.

As per Saastamoinen et al. (2017, pp. 23–37) cost calculation is taking the most time during quotation preparation process. During this phase the product variants are selected, number of required products and if requested working hours to provide the services are calculated. There are multiple ways of doing cost calculation, the method can for example be mass calculation, sum calculation, or by utilizing different computer-based tools. The complexity of cost calculation heavily depends on if the RFQ is for pure product delivery or also including services. When services are included, on top of standard working hours for setting-up and delivering the system it is important to consider if some of the following, as an example, applies; demolition works, harsh environment, non-standard working time, site facilities, transportation and storing, insurances and 3rd party inspections. Cost calculation is a key process

to run profitable business. For reference and supporting future cost calculation it is important to collect the realized cost from previous deliveries.

Saastamoinen et al. (2017, pp. 41–45) also mention the basics of price setting originate from the target profit within the annual budget. Yet it is important to consider the profit margin case by case to ensure correct price level. Product pricing is right when both buyer and seller are feeling they made a good deal. When setting the price, on top of direct cost as material and labor, one needs to consider fixed cost as for example sales and administration fees, lease, insurances, and office supplies. On top of that it is still required to consider the risk provision as well as inflation for material and labor. An important part of price setting is payment milestones. For a larger delivery there should be multiple payment milestones, preferably weighted to the beginning of delivery, to ensure the supplier is not financing the customer's project.

According to Saastamoinen et al. (2017, pp. 47–51) quotation usually consists of offer letter which is done in accordance with received RFQ. The offer letter should always include clear definition to whom it is addressed, what is quoted (reference), price and value added tax, material and work included, possible deviations for requested terms and conditions, general terms and conditions, validity of offer, payment terms and contact person details. Depending on quotation the offer letter may also include component price list for additional items and hourly price for additional labor.

Saastamoinen et al. (2017, pp. 53–54) mention the contract negotiations is the last phase of quotation process after which the final decision of supplier is made by purchaser. It is important to nominate the right resources to represent the supplier in contract negotiations. The purchaser may have wide range of questions related to not only the delivery content but also the company itself, to be answered. For future reference the minutes of all questions and answers is important. After successful contract negotiations purchaser is sending signed contract award or purchase order. The purchase order needs to be checked to match the offer letter or minutes from contract negotiations. As a response to purchase order the supplier is sending signed order acknowledgment.

The quotation preparation process involves knowledge and individual expertise of person in charge of tendering but also support from other functions as for example engineering, supply chain and management.

Stadnicka and Ratnayake (2018, pp. 866–867) emphasize that in today's competitive markets some customers requesting for quotation are mostly interested in price, which might be the only criteria for supplier selection. Considering this, supplier needs to ensure effectiveness of quotation preparation process to minimize the time and resource utilization. Also realizing the fact that the quotation might not be accepted by customer, in which case all investments are wasted.

According to Bramham et al. (2005, p. 412), many industrial suppliers are utilizing product configurators to process the RFQs. Configurators might have options to choose product configurations, indicate lead time, and cost. The configurator is typically used by supplier's sales personnel, or they at least are supporting customers in making the selections.

However, Stadnicka and Ratnayake (2018, p. 869) state that many manufacturers are not having standardized process or assigned persons for leading the quotation preparation process, despite using computer-based systems.

Bramham et al. (2005, p. 414, 417) stress applying a holistic approach to analyze the quotation process as the process is strongly interconnected with other systems which might include tacit organizational knowledge and activities across functions.

2.2 Lean

According to Nicholas and Schonberger (2018, pp. 8–9), the history of Lean originates from Toyota Motor Company. The Toyoda family had been in the textile business for a decade but expanded in car production in 1935, but the quality of cars was poor. In the 1950s, Eiji Toyoda and Taiichi Odho were visiting and studying the mass production principles at Ford's River Rouge plant. The plant was a miracle of manufacturing, in one end taking in the raw materials and rolling out 7000 car per day at the other end. As a conclusion of their study Toyota started to design a system which would be cheaper, more efficient, and flexible. The

system that Toyota developed with Taiichi Odho was called the Toyota production system (TPS). TPS is the prototype of Lean production.

Terpend and Shannon (2021, p. 65) mention the Lean was first used in automotive industry but later acknowledged as leading manufacturing principle in almost all industries. Within the last years the Lean implementations have also been applied on nonmanufacturing environment, as for example in supply chain, service, and administrative processes.

Reading the articles and publications about Lean is it easy to agree with Stone (2012, pp. 112–113) who is highlighting the importance of clear definition of the term describing an idea or concept. Lean being a good example of a term interpretated multiple different ways. For example, the following interpretations of the main principle of lean are found:

- To eliminate all unnecessary activities within the organization while the main idea of Lean is to produce the products and services 'just on time', smallest possible slots and exactly when they are needed (Laamanen & Tinnilä, 2009, p. 68).
- The importance of flow efficiency over process efficiency is the core of Lean operations strategy (Modig & Åhlström, 2013, p. 117).
- To create the highest possible customer value while minimizing resources, time, energy, and effort (Lean Global Network, n.d.).
- Learning to solve the right problems and avoiding wasteful solutions. Better quality and higher flexibility are achieved by creating a flow to identify the real problems and face them (Balle et al., 2017, p. 8).
- Process of streamlining and economizing the resources of an organization involved in work (Braun et al., 2012, p. 7).

Considering the above approaches of Lean one can conclude that the main purpose of Lean is to increase customer value while minimizing resources, time, energy, and effort. Lean thinking and practices are helping organizations being more innovative and competitive, while being more sustainable. Lean organizations are seeing problems as opportunities for meaningful learning (Lean Global Network, n.d.).

According to Barber and Tietje (2008, p. 158), despite the differences in manufacturing and sales environment, the sales process consists of sequence of activities which tend to repeat.

This emphasizes the applicability of lean principles for identifying unnecessary and wasteful activities while adding value for sales process.

Keyte and Locher (2016, p. 1) emphasize the importance of being creative enough while utilizing Lean concepts in nonmanufacturing environments to ensure the processes are aligned with the customer's expectations and will in long run make the lives of staff easier.

While starting to apply Lean on nonmanufacturing environment, Terpend and Shannon (2021, p. 64) identify the main differentiator being the intangibles involved in process. While dealing with both tangibles and intangibles mostly the problem solving takes place in higher level of organization, than in pure manufacturing environment. In most cases the outcome of the process is intangible.

Terpend and Shannon (2021, p. 66) identify several differences while applying Lean in office environment comparing to manufacturing, as seen in Table 1. Moreover, they are stating that the same tools and techniques might not be directly applicable or similarly efficient in both environments. Also, value creation in office environment is not as visible and thus also the seven types of waste might have different meaning. Table 2 illustrates the difference in waste comparing manufacturing with office environment.

Table 1. Differences between manufacturing and office setting (Terpend & Shannon, 2021, p. 67).

	Manufacturing	Office
Deliverable	Physical products	Service, file, information
Morphology	Tangible, visible	Intangible, invisible
Volume	Unlimited batch size	Unique, batch of one
Make to	Make to stock possible	Make to order
Orientation	Process-centric	Output-centric
Transformation	Procedural	Relational
Task characteristic	Very structure, no degree of freedom, no alternatives	Less structural, allows execution discretionarily, many alternatives
Wastes	Visible	Invisible
Out-of-control cases	Very limited	More frequent
Focus	Efficient	Effectiveness

Table 2. Mudas (waste) in an office setting (Terpend & Shannon, 2021, p. 68).

	Manufacturing	Office
Inventory	• Raw material • WIP • Finished items	• Documents, forms stored in a file cabinet or on someone's desk. • Computer documents stored in an electronic folder.
Overproduction	• Producing more products than needed • Make-to-stock	• Filling up more forms/reports than needed. • Print unneeded documents. • Processing items before being requested or needed
Waiting	• Wait from previous workstation, production downtime	• Wait for paper processing for approval.
Motion	• Unnecessary movement of people during production	• Unnecessary movement of people to find and process document. • Unnecessary effort to find and manipulate electronic documents.
Defects	• Defects on parts, rework defects	• Send to wrong recipient, or wrong document. • Incorrect information input on forms or documents
Transportation	• Unnecessary movement of material	• Unnecessary movement of file, whether paper files or electronic files. • Taking a file to another person
Overprocessing	• Unnecessary steps or processes leading to wasted efforts. • Duplication of activities	• Creating unnecessary files/reports, sending unnecessary information.

Terpend and Shannon (2021, p. 74) emphasize the importance to discuss with the customer to determine what is, and what is not, value-added for them.

Buzby et al. (2002 p. 513) highlight the importance of quotation process on company success. The main focus of quotation process is to provide customer reliable price and delivery time information. The process links manufacturer, customer, and outside suppliers closely

together. A well-coordinated process not only leads to winning a bid with a competitive price but also elevates the manufacturer's image in terms of responsiveness, efficiency, customer service and potential repeating business. Meeting the bid due date depends heavily on internal processes as well as the responsiveness of outside suppliers. Therefore, to create a successful bid all unnecessary cost must be eliminated, including time consumed for quotation preparation process by identifying the waste areas of processing the quotation.

Lean principles are fitting well to optimize the quotation process, for example Buzby et al. (2002 p. 514) apply the following two Lean principles in their case study of streamlining the quotation process with Lean principles.

1. Cycle time. Corresponds to firm's responsiveness and is usually measured with the actual time taken to process the quotation (receipt-to-receipt), including actual processing time, all queue time, downtime, and others. By averaging the receipt-to receipt time of all quotations prepared an average cycle time can be calculated.

2. TAKT time. Equivalent to pace, also defines the rate at which the customer requires the product. TAKT time together with Cycle time can be used to estimate workload. When Cycle time is less than TAKT time the works are done on time, while if Cycle time is greater than TAKT time there is a resource or process problem. Ideally Cycle time is close to TAKT time. The function in Figure 2 indicates how the TAKT time is calculated.

$$\text{TAKT time} = \frac{\text{Available work time per day}}{\text{Daily required demand (quotes/day)}}$$

Figure 2. TAKT time (Buzby et al., 2002 p. 514).

Streamlining the quotation process can for example be achieved with the following methods as stated by Buzby et al. (2002 pp. 517–519) applying a Web site-based quotation tool, having automatic reminders of RFQs in queue waiting for action, using electronic solutions to eliminate simple and repeating tasks, receiving supplier quotations with predefined validity period and establishing a database of historical pricing information, and establishing a

database of estimated own labor cost per product. Moreover, they are proposing to consider management techniques, such as six-sigma and just-in-time while starting to improve quotation process.

2.3 Value stream mapping

Keyte's and Locher's (2016, p. 1) definition of Value Stream Management is the following.

> "Value Stream Management involves a process for measuring, understanding, and improving and managing the flow and interactions of all the associated tasks to keep the cost, service, and quality of a company's products and services as competitive as possible."

Keyte and Locher (2016, p. 1) name the Value Stream Management to be a baseline for implementing Lean transformation on enterprise level, preventing focus falling on improving individual department processes. The basic tool of Value Stream Management is Value Stream Mapping (VSM).

VSM is used to visualize and help communicate the present process flow and enables to trace delays and restraints of process, besides giving a clear picture of current process it also gives the basis to design streamlined future condition considering improvements in terms of cost, service, and quality (Keyte & Locher, 2016, p. 7; Rachman, 2018, p. 6, 7, 13).

Through VSM can the information as total lead time, value-added time, work in progress, and information relevant to each workplace be obtained (Sremcev et al., 2019, p. 564). Moreover, Andrejić et al. (2021, p. 490) indicate that VSM should always have a view from customer's perspective, and in ideal situation customer is willing to pay for each step taken. Nevertheless, in most cases the VSM includes the processes which are crucial from company's perspective but not directly adding customer value.

In most cases, according to Rother and Shook (2003, p. 5), VSM is applied on material flow on production process but can as well be applied on nonproduction processes, in which case called office value stream. Indicating each process and what to do or make next.

Keyte and Locher (2016, pp. 6–10) advise to start the Value Stream Management process in office environment by identifying one or two value streams to start with. The process continues by mapping the tasks, the information flow, and the performance of each of the taken tasks. The result is called the current state VSM, also a baseline condition. Within the third step a team is given a change to challenge the current process and address the areas of possible improvements. Considering the improvements future state VSM, with enhanced values, better flow, and less waste is created. After that the future state vision is developed with a detailed work plan, including required improvement projects. And finally, the improvements are implemented. A principal workflow is indicated below in Figure 3.

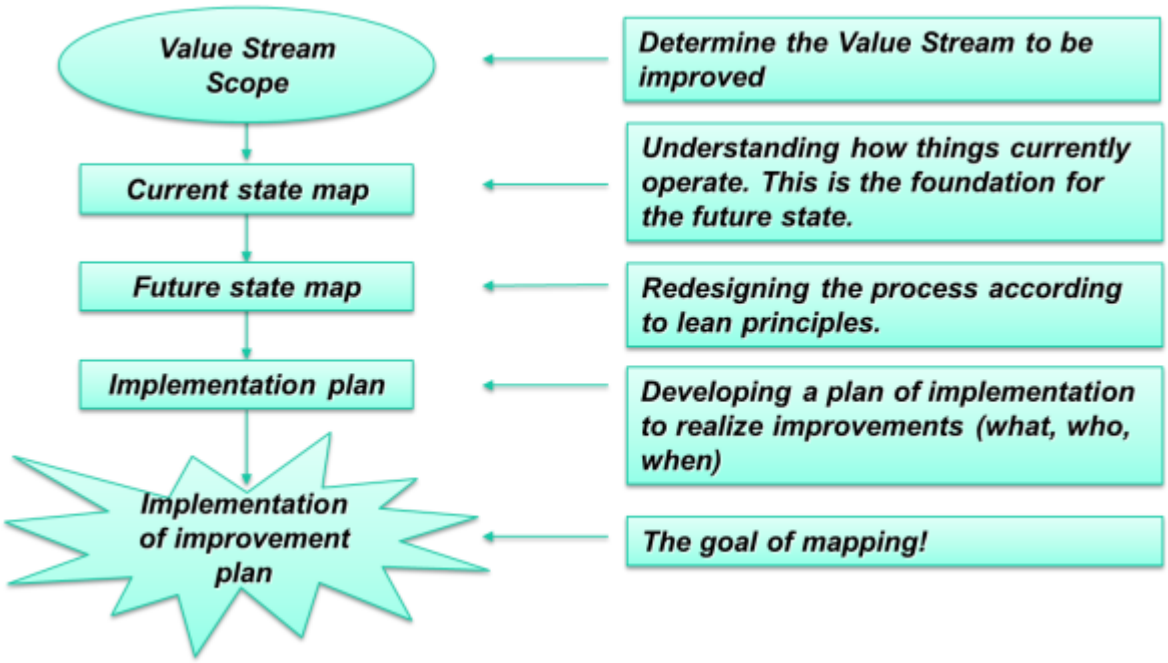

Figure 3. The main steps of value stream mapping methodology (Langstrand, 2016, p. 5).

Stadnicka and Ratnayake (2018, p. 876) define the information indicated below in Table 3 to be essential for creating the current state VSM, to be able to complete the future state VSM, and to start implementing the changes.

Table 3. Information required to complete value stream mapping (Stadnicka & Ratnayake, 2018, p. 876).

Current state VSM	• departments involved in the process, and areas of responsibility • graphical sequence of activities, together with waiting times • duration of individual activities and delays in the process, and number of repeats of loops • calculated lead time and processing time • defined and highlighted problems and confusions in the process
Future state VSM	• departments involved in the process, and areas of responsibility. • graphical sequence of activities, together with waiting times • estimated durations of presented activities • new (or revised) lead time and processing time • proposed improvements and explanations of confusions in places where earlier problems and confusions were presented
Schedule for implementation of improvements	• detected problems/confusions, source causes of problems/confusions • ways to eliminate problems/confusions • the status of improvements' implementation • persons responsible for the execution of scheduled tasks, deadlines for the completion of tasks, results of the VSM

Sremcev et al. (2019) examined in their study the usage of product configurator to improve the value stream by shortening the quotation lead time and increasing the quality. Product configurator can specifically improve the situation in companies facing increased demand of customized products. Besides providing the pricing information the product configurator can also automatically provide relevant technical documentation of products. Moreover, applying product configurator allows changes in dedicated areas of quotation, eliminating the need for the complete quotation rework, while customer requests changes.

Stadnicka and Ratnayake (2018, p. 874) underline that within the quotation preparation process the involved parties may also be cross-departmental collaborators or external suppliers, who are delivering the information required for preparing the quotation for a client. In case

VSM indicates an external supplier having significant influence in quotation lead time it is advised to improve the information flow between companies and involved parties.

Rachman (2018, pp. 14–17) in his study of improving tender creation process highlights the importance of uninterrupted work – work with one thing at a time, right balance of work between tender creating and internal reporting processes, assigning value stream manager to oversee the transition process, making sure people are doing what they are supposed to do – not other urgent jobs, having right competences at right place and solid leadership, to be the pillars for successful results of improvement process.

2.4 Conceptual framework

This subsection covers the Conceptual framework of the study, reflecting to the key elements discussed earlier in Section 2.

The first element of Conceptual framework is Value Stream Mapping (VSM). VSM will be executed by help of individual interviews in Finland and Sweden to discover the current state of product quotation process. With help of VSM principles the different phases of quotation process, including tools in use and persons involved are identified. Comparison of quotation process between countries shall be done, possible bottlenecks and best practices identified. The focus of the VSM process being in tools in use, process flow, and involvement of other functions.

The second element of Conceptual framework is Lean. The company is applying Lean Six Sigma for process improvement, for which reason it was decided to apply 5S out of Lean Six Sigma principles to the identified bottlenecks, to streamline the quotation process. The 5S consist of five elements including Sort: eliminate what is not needed; Straighten: organize remaining; Shine: clean and inspect; Standardize: write standards, and Sustain: regularly apply the standards (Leanproduction, n.d.). Considering the findings from 5S, recommendations for future state VMS can be given and actions for implementation planned.

Figure 4 below demonstrates the conceptual framework of this study.

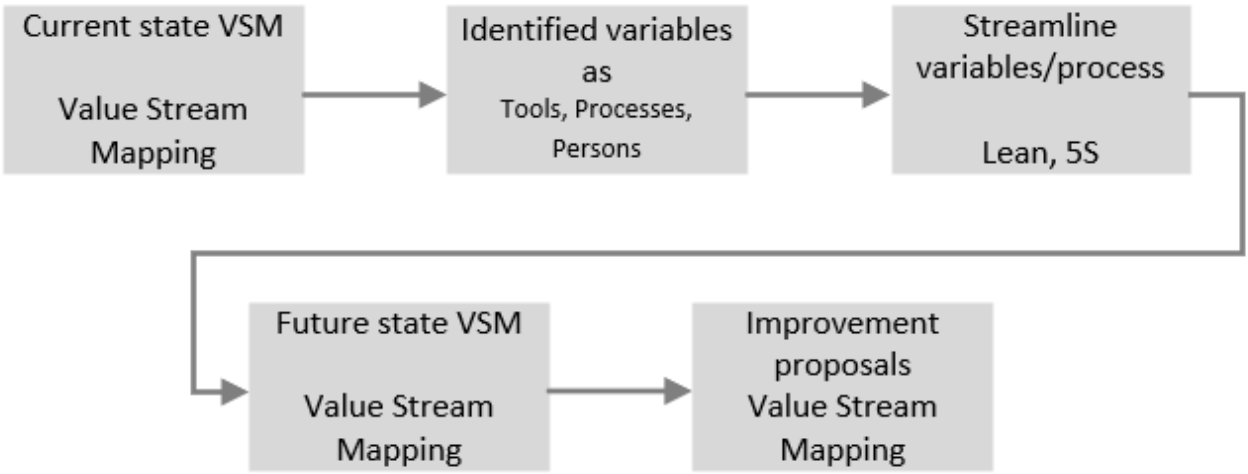

Figure 4. Conceptual framework of this study.

3 RESEARCH METHODS

The aim of this study is to map the current state of product quotation process, identify the weaknesses and ways for improvement, without compromising quality. Due to nature of the study, it was decided to use qualitative method, to gain deep understanding of named process from limited number of available interviewees.

3.1 Qualitative research

According to Hirsjärvi et al. (2013, p. 161), qualitative research is a representation of real life. Considering the reality is multidimensional where events are linked to each other's and thus may have bidirectional effects. Purpose of qualitative research is to study those interactions as comprehensively as possible, aiming to discover or reveal the facts instead of verifying existing facts.

Hirsjärvi et al. (2013, p. 164) describe the typical features of qualitative research to be for example:

1. Comprehensive information acquisition of real situation.
2. The source of information is human.
3. The purpose of study is to reveal unexpected facts.
4. Data gathering is conducted for example with theme interview, participant observation or group interview.
5. The group of informants is carefully selected.

Considering the typical features of qualitative research introduced above and the investigated quotation process in the case company, including limited number of people, the process is clearly bounded to the core activities during quotation phase, and the purpose is to identify weaknesses of the process. Thus, the qualitative research method is selected to make the study as comprehensive and multidimensional as possible.

3.2 Case study

According to Hirsjärvi et al. (2013, pp. 134–135) and Aaltola and Valli (2010, pp. 190–191), case study is a logical research strategy when examining questions “how” and “why”. The aim of case study is discovering detailed and comprehensive information of unique case or from a group of smaller cases having interconnection. Case study is typically applied when the research is focusing on individual case, the case is investigated in natural environment, and data collection is gathered utilizing multiple methods.

This thesis is a single case study aiming to get deep understanding of the current tendering process and identify the ways of improving the process by utilizing Lean framework.

3.3 Reliability and Validity of Qualitative Research

All research activities are naturally trying to avoid mistakes; thus, the reliability and the validity of single research needs to be evaluated (Tuomi & Sarajärvi, 2013, p. 134).

As per Noble and Smith (2015, p. 34), reliability, validity, and generalizability are the terms typically associated with quantitative research, in qualitative research context validity can be seen referring to integrity, application of methods undertaken, and precision of data reflections in findings, while reliability stands for consistency within the applied analytical procedures. Noble and Smith (2015, pp. 34–35) are referring to Lincoln’s and Guba’s alternative criteria’s including truth value, consistency and neutrality, and applicability while working with qualitative research, as seen in Table 4 below.

Table 4. Alternative terminology associated with credibility of qualitative research (Noble & Smith, 2015).

Quantitative research	Qualitative research	
Validity	Truth value	Recognizes that multiple realities exist; the researchers' outline personal experiences and viewpoints that may have resulted in methodological bias; clearly and accurately presents participants' perspectives.
Reliability	Consistency	Relates to the 'trustworthiness' by which the methods have been undertaken and is dependent on the researcher maintaining a 'decision-trail'; that is, the researcher's decisions are clear and transparent. Ultimately an independent researcher should be able to arrive at similar or comparable findings.
	Neutrality	Achieved when truth value, consistency and applicability have been addressed. Centres on acknowledging the complexity of prolonged engagement with participants and that the methods undertaken and findings are intrinsically linked to the researchers' philosophical position, experiences and perspectives. These should be accounted for and differentiated from participants' accounts.
Generalizability	Applicability	Consideration is given to whether findings can be applied to other contexts, settings or groups.

Noble and Smith (2015, pp. 34–35) are also describing for example the following methodological strategies which can be applied by qualitative researcher.

- Accounting for personal biases which may have influenced findings.
- Acknowledging biases in sampling and ongoing critical reflection of methods to ensure sufficient depth and relevance of data collection and analysis.
- Meticulous record keeping, demonstrating a clear decision trail and ensuring interpretations of data are consistent and transparent.
- Including rich and thick verbatim descriptions of participants' accounts to support findings.
- Demonstrating clarity in terms of thought processes during data analysis and subsequent interpretations.

3.4 Data collection

According to Alasuutari (2011, p. 84), it is natural to utilize flexible data collection methods while proceeding with qualitative research. This enables researcher to change the aspects and set of tools if seen necessary.

King and Horrocks (2010, p. 35) state that “Flexibility is a key requirement of qualitative interviewing.” Conducting qualitative interviews differs from traditional interview format of quantitative interview as the fixed questions with predefined order is not appropriate. Qualitative interview is to be seen as interview guide where questions are outlining the topics to be covered but keeping the flexibility of questions phrasing and sequence they are asked for, this enables interviewee to lead the interaction to even unforeseen directions. Thus, semi-structured interview is logical choice while conducting qualitative interviews as this method only outlines the questions asked but doesn’t give predefined answers, instead interviewee have a freedom to answer as he/she wishes (Eskola & Suoranta 2005, p. 86).

King and Horrocks (2010, pp. 37–38) mention the aim of qualitative interview is to obtain participants experiences, not answers to specific questions as in surveys. Considering this, any insights gained from first interviews can freely be applied to subsequent ones if seen necessary in terms of importance of phenomenon studied.

Data collection is completed with semi-structured interviews, applying the same set of question for each interviewee, to gain the deepest possible understanding of current tendering process, and to collect all ideas for future development, while ensuring the consistency of research. In total three interviewees, out of six-person team, are selected from Nordic tendering team of the case company and the participants are the subject matter experts of the research topic, ensuring sufficiently depth data collection and validity. Each interviewee is in advance contacted over phone to introduce the study and agree the time slot and principles for interview. Individual interviews are conducted over Teams meeting with recording and transcripts to ensure data collection reliability.

Researcher has earlier worked in tendering team which ensures easy and open communication with interviewees, also most of the tools and principles are familiar for researcher which makes data collection easier. Considering the past experience of the researcher, interview

transcripts are carefully worked out and direct citations from interviews used, to demonstrate interviewees perspectives are used, not researcher's, ensuring reliability of the research. By doing this the criteria's by Noble and Smith discussed before in Chapter 3.3, including truth value, and consistency and neutrality are ensured.

3.5 Analysis of data

According to Eskola and Suoranta (2005, p. 145) qualitative data analysis has two principal approaches 1. Strong focus on data, work out the analysis and interpretations out of it, and 2. Considering data as source material for theoretical thinking, guiding tool, or source for interpretations. On the other hand, King and Horrocks (2010, p. 142) are introducing one commonly used categorization based on analysis focus being either on language or the actual content of what interviewees have said. The latter one is most used in qualitative case studies and seeks to understand interviewees actual experiences from real life. Thematic data analysis approach in normally applied when analyzing experience-oriented data.

This thesis being a case study of actual process of the case company thematic data analysis approach is to be applied.

King and Horrocks (2010, pp. 143–144) emphasize that the data collected via interviews requires processing before the analysis phase, typically the recorded data is typed in text, which is called transcription. Transcription can be done word for word but due to heavy investment of time required for this it advised to be considered is this really is necessary. At least it should be considered right at the start of the project what needs to be transcribed and how detailed. Specifically for case studies, only the most relevant and interesting parts could be fully transcribed, and the rest summarized. Or alternatively identify some key interviewee and fully transcribe this one while summarizing the rest.

Thematic analysis is based on identifying repeating themes from collected data. King and Horrocks (2010, p. 150) definition of theme in thematic analysis

> Themes are recurrent and distinctive features of participants' accounts, characterising particular perceptions and/or experiences, which the researcher sees as relevant to the research question.

Within this study the main themes and relations between them are identified, together with sub-themes. This categorization is required to divide the data to logical entities helping analysis process and increasing transparency of data for other readers.

4 RESULTS

4.1 Data collection and sampling

Semi-structured interviews were conducted with three tendering professionals, two from Finland and one from Sweden, to identify possible differences in working methods between countries. When agreeing the interview time, it was also agreed the interviewees shall take place from home, to ensure uninterrupted participation. Each of the interviews lasted 45 to 60 minutes and were conducted over Teams using recording and transcript, to enable reliable and easy access to the information at later stage. All three interviews were conducted in English, being the official language of case company.

Transcriptions were first collected in Excel table per question, using color coding between interviewees. Interviews were analyzed as individuals as well as per question to highlight the main theme of each question and to easily recognize the similarities.

Interviews were conducted mid of May 2024. The interviewees profiles are illustrated in below Table 5.

Table 5. Interviewee profiles.

Title / position in company (Country)	Name	Working experience in field (<5, 5–10, 10–15, 15> years)	Working experience in tendering (<5, 5–10, 10–15, 15> years)	Interview date
Bid Manager (FI)	A	10–15	<5	10.05.2024
Bid Manager (FI)	B	<5	<5	10.05.2024
Contract, Bid, and Proposal Management Experienced Professional (SE)	C	15>	15>	17.05.2024

4.2 Findings from the interviews

In the following chapters the interview findings are introduced and analyzed as a whole, not individually, based on the sequence of questions asked during interview. The first part of interview questions was focusing on current tendering process while the second part on collecting the development ideas.

4.2.1 What is the current Product quotation process in Tendering Nordic countries?

The aim of the first interview question was to find out if the tendering workflow is clearly documented and easy to follow by the employees in charge of tendering. There was a clear difference between interviewees from Finland and Sweden. Neither of the interviewees from Finland recognized the existence of such documentation; instead, the quotation process was something coming out of memory, based on experience. Interviewee C from Sweden could directly name the location of such documentation.

> Interviewee A: “In my own head, I do have a clear process, so it's based on experience. But if you would ask me if it's somehow structured somewhere I would have to say no. If there's changes that are being communicated in a separate communication, then investigating the changes but not a processes whole. So, it's kind of a bit here and there information. You need to collect that one by yourself.”

> Interviewee B: “Well, I don't think there is any written instructions. It's mostly a knowledge that has been taught during working here. Kind of quiet information.

> Interviewee C: “Yes, I do. SharePoint documents how the process works for loose products.”

With the second question the aim was to find out the ways how tendering team is receiving RFQs and how do they decide who will be starting to work for bid. In both countries there is a country specific, shared email address, which is the main source of RFQs. Interviewee A and C also mentioned that they are receiving plenty of RFQs in their own email addresses. The major difference was realized with the way of handling the shared email, in Finland there is no one officially nominated to look after the email box, while in Sweden there is a predefined

one-week cycle for person in charge. All interviewees mentioned it is only own coordination between tendering colleagues to decide who will handle the bid, manager not involved.

> Interviewee B: “For the product tendering, we received the queries mostly over email for the common Sales box.”

> Interviewee C: “We have a shared mail address and I have my own mail address. Most of our customers know my mail address or they know our shared mail address. We are about 10 people who has access to this shared mail address and when we get request or an order, it will end up in this shared mail address Mailbox. And this Mailbox we have sub folders with our own names. One week per person responsibility of mailbox is assigned.”

The purpose of third question was to find out how the tendering people are defining the exact technical content of bid to be in line with customer request. For all interviewees the simple product bids were based on their competence, previous history, and experience. Sometimes customer can define the exact material codes within their request, in which case it is simple to create a bid accordingly. Some customers are sending technical documents together with RFQ which then needs to be studied for product selection. In case there is any doubt of what is to be offered, all interviewees were turning to organization’s support to verify the content before bidding.

> Interviewee A: “Depends on the scope. If it's something I can cover with my own competence. Then it's coming from the experience, but also relying on the operation unit inputs.”

> Interviewee B: “Usually the customer has some idea what they want us to offer or what they want to buy. If customer don't specify exactly what they want then we need to first request some additional specs or information, and then depending on the product I can, from the previous knowledge, know what to offer or I need to read some documentation from some other products. It's mostly dependent on what they want, and sometimes I can lean on my colleagues and ask for their expertise.”

> Interviewee C: “I have to read the customer requirements because sometimes they are not clear, and you have to look into the Electrical Scheme. If I'm unsure what to offer them, I always ask one of the technicians in factory. I let him double checked the electrical scheme and the original question.”

The fourth question was about the tools utilized for tendering. All three interviewees named the Business Online (BOL) being the most important tool. BOL is inhouse online configurator for checking the sales price of different products. Moreover, it is used to configure the functionality of configurable products and to print out the technical content of the product to be offered. Putting together the bid documents interviewees A and B are utilizing Excel based tool developed for these purposes, including offer letter and scope of supply. Interviewee C instead mentioned she is printing out the offer from BOL and having readymade commercial terms document which she is attaching on email offer as overall offer package.

> Interviewee A: “We do have a tendering tool for putting together the bid documents, so the offer letter and the scope of supply. That is the Excel based tool developed specially for that purpose.”

> Interviewee B: “At the moment, one tool that we always use is Excel and then Business Online play’s critical role. BOL is factory tool providing pricing information and enabling ordering the products from factory.”

Fifth question was seeking out from where the tendering team is collecting the pricing information. All interviewees mentioned the BOL being the primary source of pricing information. Besides that, interviewee A mentioned sometimes having a need on asking dedicated quotation from supplier for non-commonly sold products.

With the question number six the aim was to find out what other functions of organization is required to be involved during tendering process. All interviewees were utilizing peer review or support in case they were uncertain of the content to be offered. Besides that, interviewee A highlighted the importance of engineering team knowhow of products and sales team knowledge of market pricing and pricing strategy. Also, she mentioned the requirement of management review in case the monetary value of bid is exceeding certain limits.

> Interviewee A: “And also depends on the volume. Then there’s certain processes in place when we reach the volumes. Concept where need to get the local management level review and approvals and then if we go upper scale then need to involve higher management in Europe.”

Question number seven was aiming to find out how much time is in average required to prepare one bid. In general, all interviewees estimated the time consumed for one being between 15 minutes to one hour, for a simple product bid, for which the price information is

directly available from BOL. When the bid includes configurable products and discounts are requested from factory there is usually approximately one day delay for submitting the bid. Interviewee C is also working with bids for old legacy products for which there is no price information directly available from BOL and thus requires offer from factory. The price request process from factory is simple and straightforward but getting a reply from factory might take up to two weeks. Interviewee A had experience of large and more complicated bids, including several products from different factories in which case the process might take anything between one to four weeks. Most of it is stand-by time but requires active communication towards both factory and customer. The stand-by time is causing additional stress as the process is out of own hand.

> Interviewee A: “Where the volumes are significant, needs strategy for pricing, complicated mix of the products involved, or where there is a need to gather products from several sources and get the pricing right, then to run the approval processes, it can take anything between a week to a month. Now I mean the own part is just collecting the inputs into the tendering tool. That part is probably the easiest part on that which I do myself. That requires me being physically involved. A lot of that time in those tenders are off. It will be waiting time and email writing time which is not 100% involvement into the process itself. So, a lot of time goes on waiting for input from product supplier and then also in the approval process is it's about getting the time slot where all the needed parties are involved. Is no more than few days, but it's how to say must stand by and have to be ready at any point in that time to be back to the tender in question.”

Eight question was asked to find out how the tendering team feels about the current tendering process. Aiming to find out if there are some parts of the process shouldn’t be changed and as well getting the inputs of areas for improvement. Here the interviewees had quite a different opinion of the current tendering process, which originates from their experience and the nature of bids they are working with. Interviewee A felt the most important improvement would be an online tool to give visibility of tendering process, and specifically status of approval process, indicating directly whose actions are pending. Reducing idle time would reduce stress and when there is a clear visibility of process it would be easier to focus on other bids during idle time. Interviewee B was questioning the whole product tendering process as is by today, according to him a modern web shop linked in company ERP system would do everything automatically. While interviewee C was just happy with the current process from RFQ to submittal of bid. She as well as interviewee B highlighted the efforts required to handle the internal order booking processes after receiving an order from customer. Every single

product from the order is required to be specified either in dedicated Excel file or alternatively filled in to the ERP system manually. The major difference here is between countries, in Finland tendering is responsible for filling the order intake information while in Sweden there is a dedicated persons to handle this.

> Interviewee A: “I think it comes to the previous question. There's a lot of idle time and big gaps where things doesn't depend on what I do, but I have the ultimate responsibility for the tendering completion, so that feels a little mentally heavy to have open projects that, you know, it needs to be finished, but you cannot do much to get them finished.
>
> We have very little visibility over where the process is currently, so the only tool I have is writing emails and polling people in teams, but there's no such visibility that I could look into process.”

Nineth and the last question regarding current tendering process asked to name the biggest bottleneck of tendering process to give an idea what the most critical part of process is to focus on. Interviewee A named the biggest bottleneck being the availability of price information, which is causing delays in bid submittal. While interviewee B was seeing the whole process too much time consuming which itself is causing bottlenecks as there is always a queue of new RFQs waiting for actions to be taken. Automating the product sales process would free up the time to be spend with larger and more complex turnkey project, including work package on top of products.

> Interviewee C: “Actually, we don't have any bottlenecks. The tendering process, BOL, it's simple and acceptable, very fast. I will say I do like it.”

4.2.2 How can the Product quotation process be more efficient and faster without compromising quality?

Within the first question it was asked to name the most time-consuming or troublesome part of product quotation process and how it could be developed. The comments given by interviewees largely varied. Interviewee A connected this tightly with previous question of biggest bottleneck of current tendering process, telling factory provided price lists are expiring twice a

year and the new revised price lists are received only a few days of maximum a week in advance. In case one is preparing bid within 30 days from expiration it is hard to know how to price those products, as the bid validity towards customer in minimum 30 days, sometimes event 90 days. As a solution she proposed named persons from supply chain management to take the responsibility of price list validity. Interviewee B also referred to previous question where he gave critic to the overall product tendering process but named specifically the process from booking to shipping. During this phase there is too much manual data entry required in different systems. Interviewee C highlighted the time-consuming process to get the prices from factory for old legacy products, which she already brought out in the question number seven while discussing of current tendering process.

> Interviewee A: One aspect is the price validity. We operate on price lists and this one time offers to customer might be required with longer validity. Then you have to be very careful to check those dates. But then, if you have doubts or the validity is out, then it can sometimes cause significant delays to get them renewed."

> Interviewee B: "After we received an order then we have to do a lot of manual, time-consuming data entry work to the Excel and BOL. So, I think that is the most time consuming and troublesome part, as for this we need to find the material codes from ERP system, and we have different codes in BOL That takes a lot of time as systems are using different codes."

> Interviewee C: "I don't know how it could be improved, but the Combiflex where we do not have any prices in Business Online (old legacy models) but still sell them. Faster process to get the price for them."

The second question was to find out if there are some product configurators provided for end customers to shorten the quotation lead time. Both interviewee A and B didn't recognize any this sort of tools, except the price lists provided to some customers. Interviewee B also mentioned about future plans of developing some web-based tool, also accessible by end customers. While interviewee C told they have Excel based tool for helping end customers making the product selections for configurable products. From the Excel tool end customers are getting out exact products code, based on which they can ask for bid. This is minimizing the time required to be spent for bid preparation as all technical content is already known.

> Interviewee A: "Only thing I know of is the price lists for let's just say non configurable products."

> Interviewee C: “Yes, we have the Excel Configurator available. We send it to our all our customers to make their own configuration if they can. In this Configurator they can also see conflicts. No pricing, just IED code from this configurator but it minimizes my time to sit and read the documents.”

The aim of the third question was to find out how much other, non-planned, tasks are interrupting ongoing tender process. Interviewees A and C brought out there is lot of add-hog activities taking place, even up to 60 to 80 percent of daily working time while for interviewee B the same was around 30 to 40 percent. Interviewee A also highlighted organizing daily workload and activities is just her own task, thus improving her own methods could reduce the number of add-hog activities. On the other hand, she was also wondering if add-hog activities could be reduced by nominating a person in charge for assigning the activities for team members. Having one person looking after all incoming requests and ongoing activities could help on balancing the workload between team members as he/she would know workload of everyone. Interviewee C mentioned she has constant and open dialogue with her colleague, with whom she is sharing the tendering responsibilities, and help is always available when needed.

> Interviewee A: “I need to improve my working methods. I very, very rarely take uninterrupted working time. During the day, react a lot to everything that comes through email or teams. I think it would help a lot if there would be structured way for directing the tenders and somebody, one person maybe using the time to decide which tender is going go which way and looking into the timelines and what fits, like organizing the workload.”

> Interviewee C: “Add-hogs takes very much of my time, it’s like 80% of the day. I try though to the empty my mailbox every day to be in time.”

Fourth question: Are you getting sufficient support from other functions to prepare quotations? If not, how this could be improved? Interviewee C clearly stated she does not require any extra support. She can rely on her colleague with whom she is sharing the tendering responsibilities, both having long experience and high expertise. Both interviewees A and B they are overall happy for support received. However, as there are no dedicated sales support persons in organization, sometimes replies from engineering team might be delayed due to their own priorities.

> Interviewee A: “I feel quite satisfied. People are helpful. Of course, it depends on their workload, and which point which point of time they can support. Actually, the feel factor here is that it's very much based on a personal relationship, so you need to know specifically the person to ask. There is no, how to say, formal way of directing the sales support requests.”
>
> Interviewee B: “I'd say overall yes, I get sufficient support, and this can be by utilizing existing instructions or asking help from other colleagues.”
>
> Interviewee C: “I don't see any need for extra support. If my colleague has started up something and he must run away for something else, or if he has meetings and cannot continue, I can always do the rest of his work and he can do the same with mine because we have this daily dialogue while talking to each other and explaining what we are doing or not.”

The fifth and final question of the second part of interview questions was to collect concrete improvement proposals for tendering process. Interviewee A sees the most critical would be to clearly define the role of tendering resources. By today tendering is also responsible of order booking which at some point of time has been taking up to two third of her working time. Having dedicated team handling order booking would allow tendering to better focus on ongoing tenders, reduce add-hog activities and reduce overall stress. While interviewees B and C expressed very clearly the need to have web shop or e-trade platform where the customers can directly configure different products, see the price and delivery terms, as well as handle the ordering and payment, all by themselves.

> Interviewee A: “Well, one aspect we didn't cover here at all is where the tendering role begins and ends. All the conversation we have had so far is little bit like the tendering ends where you submit the offer, in reality it doesn't. There might be comments from the customer, you'll fix it, you submit again. If you get an order, you need to handle it as it's in the tendering responsibility to also book the order into the correct system. And my personal experience that I have had, especially with the product sales, I have had a lot of workload from that post order activities. From my personal view this extended tendering role could be handled somewhere else, it consumes a lot of resources and time and it's not really a part of sales phase anymore. Right now, in the organization, there is no such responsibility as how to handle the OR from the Order arrival to delivery. At this point, it's still in the tendering. I would propose that part to be removed from tendering function under own task.”
>
> Interviewee B: “The main way would be to give customer an access to the BOL, so they could directly order the required materials for themselves without us entering the same information multiple times in different systems”

Interviewee C: “e-trading, something like Amazon as an example.”

5 ANALYSIS OF INTERVIEWS

Interviewee A and B admitted that there is no or at least they haven't seen clear written instructions to follow for tender preparation process which is in line with Standnicka and Ratnayake's (2018) finding in Chapter 2.1, that many manufacturers are not having standardized process or assigned persons for leading the quotation preparation process. Interviewee A also questioned the current way of working with tenders where there is no-one looking after the team's overall quota/workload.

What comes to tendering tools all interviewees named the most important tool being used being Business online (BOL). A web-based configuration tool for product, which on top of product functionality also gives price and delivery time information. This is in line with Barmham et al.'s (2005) findings in Chapter 2.1 which stated the product configurators are commonly utilized by industrial suppliers' personnel. Moreover, Chapter 2.3 discussed the product configurator's ability to automatically provide technical documentation, which also applies in Case company. Interviewee C also told they have developed special Excel based tool to be shared with their customers to let them configure the products by themselves. The output from the tool is product configuration code against which interviewee C can quickly give a quotation. Applying a tool of this kind is reducing the efforts required from tendering team and thus in line with Lean principles discussed in Chapter 2.2.

Interviewee A highlighted the importance of discussing with sales team during tendering process due to their knowledge of market pricing and pricing strategy. This corresponds with Saastamoinen et al.'s (2017) statement in Chapter 2.1 to carefully consider the profit margin case by case to ensure current price level.

While discussing about interviewees general feeling and biggest bottleneck of current tendering process, interviewee B and C highlighted the efforts required to handle the internal order booking processes after receiving an order from customer. This part of process involves filling up the information in multiple system and formats and is not seen reasonable. As well interviewee A gave critic of approval process which is slow and non-transparent. These comments can be considered as Mudas (waste) in the Lean theory as indicated in Table 2 in Chapter 2.2. Interviewee B even criticizes the overall existing tendering process, according to him the whole process could be replaced with Web based tool. This comment is supported by

Buzby et al.'s (2002) examples in Chapter 2.2 of how to streamline the quotation process. All above comments are good examples of areas Lean is worth of considering to streamlining the process, minimizing resources, time, energy, and effort, as described in Chapter 2.2 (Lean Global Network, n.d.).

Interviewees A and C brought out their hectic working hours with a lot of add-hog activities taking place during a day, taking their focus from active tender preparation to something else. Interviewee A also mentioned additional work and pressure caused by following the price approvals from factories. These are the same topics Rachman (2018) in Chapter 2.3 has highlighted to be the focus areas based on his own study of improving tender process. Rachman's comments of making sure people do what they are supposed to do and having right competences at right place is also in line with interviewee A's request of having clearly defined role for tendering resources. By today tendering is also working with order booking while it could be done by other functions, letting tendering focus on tender preparation.

Interviewee A indicated the biggest problem of tender preparation process to be linked in receiving factory pricing information. Being it renewal of common price lists which are typically valid for six months or requesting factory price for dedicated larger project delivery. This refers to VSM finding discussed in Chapter 2.3 indicating the information flow between parties should be improved. Nevertheless, as interviewee A mentioned she has no other tools than just sending reminder emails and hoping for actions to be taken. Which again links to Chapter 2.2 where Terpend and Shannon (2021) state that when applying Lean on nonmanufacturing environments solving the problem takes place in higher level of organization. Streamlining the previously mentioned troublesome pricing process would require managerial involvement from both sides.

6 CONCLUSIONS

6.1 Theoretical contributions

What is the current Product quotation process in Tendering Nordic countries?

Quotation process consist of sequence of actions to be completed to evaluate the RFQ, determine the production cost, set the sales price, and prepare the quotation as indicated by Saastamoinen et al. (2017) and discussed under Chapter 2.1. Jaques (2013) highlights the importance of careful evaluation of RFQ including three questions to be answered honestly 1. Is it deliverable? 2. Is it winnable? and 3. Will it be profitable? before investing any time and resources on tender preparation. According to Buzby et al. (2002), the quotation process plays important role in company success, linking supplier, customer, and outside suppliers closely together. High quality and on time bid demonstrate suppliers' responsiveness, efficiency, and customer service.

Value stream mapping was presented in Chapter 2.3. VSM can be used to analyze the current process flow to identify delays and restraints of process. Within the interviews conducted (Chapter 4.2.1) the current tendering process was clearly explained, and the most critical improvement areas highlighted by interviewees.

How can the Product quotation process be more efficient and faster without compromising quality?

Chapter 2.2 covers the basic principles of lean which can be considered as todays main theory for process optimization. For example, Terpend and Shannon (2021) indicate lean can be applied in office environment considering the fact that tools and technics used might be different and waste might have a different meaning, comparing to manufacturing environment. Typical focus areas in office environment are information, information flow, effectiveness, waiting time, unnecessary data processing, and on-time actions.

The second part of the interview questions (Chapter 4.2.2) focused on how to improve the product quotation process and the results received as for example web-based configurator and price list validity are fully in line with Buzby et al.'s (2002) recommendations for the

actions for streamlining the quotation process. Also, other inputs received as unnecessary data processing and waiting time are as indicated in Terpend and Shannon's (2021) listing of waste in office environment and listed in Table 2.

6.2 Practical (Managerial Implication)

This study clearly indicates handling of tendering process is highly dependent on person in charge and his/her personal knowhow. The tendering process might be documented but not precisely followed, while onboarding new people the learning is mostly based on human-to-human interaction, not familiarization of existing documents.

The study clearly shows the following topics raised as the most important development areas and should be taken up with persons in charge.

- Price list renewal well in advance (minimum 30 days) before expiration of existing prices. Unknown prices are causing additional work and uncertainty during tendering.
- Clear definition of tasks included in tendering role from the perspective what gives the best value for company. As an example, preparation of order booking documents is handled by tendering in Finland while order booking team in Sweden.
- Knowledge sharing between countries for example, how to efficiently utilize the existing tendering tools.
- A new web shop platform enabling customers direct access to configure, price, and order products, without involvement from tendering team.
- Item codes in BOL or newly developed web shop ("Power Shop") needs to be the same as used in ERP system to avoid manual data entry during order booking.
- A tool to trace the status of approval process, whos' actions are waited for, while requesting price or discount from factories. Currently this is invisible process and causing additional stress among tendering team.
- Currently tendering team is under heavy load and handling a lot of add-hog activities which always moves focus from active tendering work to something else. Could consider would it help if there would be one person, knowing workload of every resource, assigning new coming tasks to the team.

6.3 Limitations and Further research

The case company in this study has backgrounds in country specific organizations which comes out as differences in tendering processes during this study. The study covers only three interviews, covering Finland and Sweden, which can be seen as limitation. However, the three persons, out of six-person team, selected to be interviewed are the ones daily handing product quotation. Remaining three persons are more sales and/or system tendering oriented. Tendering Northern Europe also covers Norway and Denmark where currently sales is handling tendering activities. Interviewing representatives from Norway and Denmark could have been bringing some additional aspects to be considered. Yet it is not foreseen increasing the number of interviews would have been changing the base findings of this qualitative research.

While considering of establishing centralized product tendering team to cover Northern Europe region it is advised to have further study of country specific requirements of bids and common practices to serve customers. From the results of this study, it is clearly seen different practices are applying today.

This study brings out the importance of new and modern web shop solution which has been told to be under development. To ensure the new platform serves the purpose in best possible way, minimizing the actions required from tendering team, a further study of new platform capabilities is required. This study could be utilized as initial inputs to cross check the functionality of new platform.

During the study end of life announcement for the current Web based product configurator, BOL, was released. A new replacing “Power Shop” is under development and estimated to be taken in use during end of year 2024. As of today, it is not known if the findings of this study are applicable to "Power Shop”.

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APPENDICES

Appendix 1. Interview Questions

Appendix 1. Interview Questions

The formatting of appendices depends on the type of the appendix. If several appendices are included, make a new part for each of them.

6. Current product tendering process.
    a. Do you have a clear tendering process to follow for your work?
    b. How and from where do you receive RFQs and how is it decided who will start on the offer?
    c. Where do you find or how do you define the exact technical content to be offered?
    d. What tools are you using for tendering?
    e. Where are the product prices taken to from?
    f. Who do you need to involve during tendering process?
    g. What is your estimate of time required to prepare one quotation?
    h. How do you feel in general about current tendering process?
    i. Where are the biggest bottlenecks during tendering process?

7. How the product tendering process could be developed?
    a. Can you name the most time-consuming or troublesome parts of product quotation process and how those could be improved?
    b. Do you know if product configurators for end customer usage is developed to shorten the quotation lead time?
    c. Do you have uninterrupted working time for preparing quotations or does add-hogs take place?
    d. Are you getting sufficient support from other functions to prepare quotations? If not how this could be improved?
    e. Do you have concrete improvement proposals?